We claim:

1. An equalizer, comprising:

an equalizer core coupled to an input signal from a transmission medium and a bandwidth control signal, wherein the equalizer core applies a transfer function to the input signal to compensate for losses incurred in the transmission medium and generates a core output signal, and wherein the bandwidth control signal controls a bandwidth of the transfer function;

a slicer coupled to the core output signal that converts the core output signal to a digital output signal having a fixed digital output swing, wherein the fixed digital output swing approximates a transmission swing of the input signal prior to transmission over the transmission medium; and

an automatic gain control (AGC) loop coupled to the core output signal and the digital output signal that compares the core output signal with the digital output signal and generates the bandwidth control signal.

2. The equalizer of claim 1, wherein the bandwidth control signal varies the bandwidth of the transfer function as a function of a data rate of the input signal.

3. The equalizer of claim 1, wherein the transfer function approximates an inverse of the losses incurred in the transmission medium.

4. The equalizer of claim 1, wherein the AGC loop also generates a gain control signal that is coupled to the equalizer core and controls a frequency dependant gain of the transfer function.

5. The equalizer of claim 1, wherein the AGC loop limits a bandwidth of the core output signal and the digital output signal and compares a band-limited core output signal with a band-limited digital output signal to approximate an energy difference.

6. The equalizer of claim 5, wherein the bandwidth control signal is generated by the AGC loop as a function of the energy difference.

7. The equalizer of claim 5, wherein the AGC loop also generates a gain control signal that is coupled to the equalizer core and controls a frequency dependant gain of the transfer function, and wherein the gain control signal is generated by the AGC loop as a function of the energy difference.

8. The equalizer of claim 5, wherein the AGC loop also varies the bandwidth of the core output signal and the digital output signal as a function of the energy difference.

9. The equalizer of claim 5, wherein the AGC loop varies the bandwidth of the core output signal and the digital output signal as a function of a data rate of the input signal.

10. The equalizer of claim 1, wherein the transmission medium is a coaxial cable.

11. The equalizer of claim 1, wherein the transmission medium is a printed circuit board trace.

12. The equalizer of claim 1, wherein the AGC loop is implemented as a proportional (P-type) controller.

13. The equalizer of claim 1, wherein the AGC loop is implemented as an integral (I-type) controller.

14. The equalizer of claim 1, wherein the AGC loop is implemented as a combination proportional/integral (PI-type) controller.

15. The equalizer of claim 1, wherein the equalizer core comprises:

a variable filter coupled to the input signal and the bandwidth control signal that varies the bandwidth of the transfer function.

16. The equalizer of claim 15, wherein the variable filter is a variable low-pass filter.

17. The equalizer of claim 15, wherein the variable filter implements a filter transfer function having a pole frequency, and the bandwidth control signal varies the pole frequency.

18. The equalizer of claim 1, wherein the equalizer core comprises:

a transfer function block coupled to the input signal that applies the transfer function to the input signal and generates a transfer function output signal;

a variable low-pass filter coupled to the transfer function output signal and the bandwidth control signal, wherein the variable low-pass filter varies the bandwidth of the transfer function output signal and generates a filter output signal; and

an adder coupled to the input signal and the filter output signal that generates the core output signal.

19. The equalizer of claim 4, wherein the equalizer core comprises:

a transfer function block coupled to the input signal that applies the transfer function to the input signal and generates a transfer function output signal;

a multiplier coupled to the transfer function output signal and the gain control signal that varies the frequency dependant gain of the transfer function output signal and generates a multiplier output;

a variable low-pass filter coupled to the multiplier output and the bandwidth control signal that varies the bandwidth of the multiplier output and generates a filter output signal; and

an adder coupled to the input signal and the filter output signal that generates the core output signal.

20. The equalizer of claim 19, wherein the gain control signal varies from zero to unity as the transmission medium approaches a maximum length.

21. The equalizer of claim 1, wherein the equalizer core is a multi-stage equalizer core having a plurality of individual equalizer core stages.

22. The equalizer of claim 21, wherein the AGC loop generates a plurality of individual-stage bandwidth control signals, and wherein each multi-stage equalizer core comprises:

a variable low-pass filter coupled to one of the individual-stage bandwidth control signals that varies the bandwidth of the transfer function.

23. The equalizer of claim 21, wherein the individual equalizer core stages sequentially apply individual-stage transfer functions to the input signal, wherein each individual-stage transfer function is capable of compensating for a portion of the losses incurred in a transmission medium of a maximum length.

24. The equalizer of claim 21, wherein the individual equalizer core stages each supply a substantially equal portion of a frequency dependant gain of the transfer function.

25. The equalizer of claim 1, wherein the AGC loop comprises:

a first filter coupled to the core output signal that generates a first band-limited signal; and

a second filter coupled to the digital output signal that generates a second band-limited signal;

wherein the AGC loop compares the first band-limited signal with the second band-limited signal to generate the bandwidth control signal.

26. The equalizer of claim 25, wherein the first and second filters are variable band-pass filters, and wherein the AGC loop also generates a band-pass control signal that controls a bandwidth of the variable band-pass filters.

27. The equalizer of claim 1, wherein the AGC loop comprises:

a first envelope detector coupled to the core output signal that generates a first energy-level output; and

a second envelope detector coupled to the digital output signal that generates a second energy-level output;

wherein the AGC loop compares the first energy-level output with the second energy-level output to generate the bandwidth control signal.

28. The equalizer of claim 27, wherein the first and second envelope detectors are rectifiers.

29. The equalizer of claim 1, wherein the AGC loop comprises:

an adder that compares the core output signal with the digital output signal and generates a single-stage gain control signal, wherein the bandwidth control signal is generated as a function of the single-stage gain control signal.

30. The equalizer of claim 29, wherein the AGC loop further comprises:

a sequencer coupled to the single-stage gain control signal that generates the bandwidth control signal.

31. The equalizer of claim 4, wherein the AGC loop comprises:

an adder that compares the core output signal with the digital output signal and generates a single-stage gain control signal, wherein the bandwidth control signal and the gain control signal are generated as a function of the single-stage gain control signal.

32. The equalizer of claim 31, wherein the AGC loop further comprises:

a sequencer coupled to the single-stage gain control signal that generates the bandwidth control signal and the gain control signal.

33. The equalizer of claim 4, wherein the AGC loop comprises:

a first variable band-pass filter coupled to the core output signal and a band-pass control signal that generates a first band-limited signal, wherein the band-pass control signal controls a bandwidth of the first variable band-pass filter;

a second variable band-pass filter coupled to the digital output signal and the band-pass control signal that generates a second band-limited signal, wherein the band-pass control signal controls a bandwidth of the second variable band-pass filter;

a first envelope detector coupled to the first band-limited signal that generates a first energy-level output;

a second envelope detector coupled to the second band-limited signal that generates a second energy-level output;

an adder coupled to the first energy-level output and the second energy-level output that generates a single-stage gain control signal; and

a sequencer coupled to the single-stage gain control signal that generates the bandwidth control signal, the gain control signal, and the band-pass control signal.

34. The equalizer of claim 33, wherein the first energy-level output is coupled as negative input to the adder and the second energy-level output is coupled as a positive input to the adder.

35. A method of compensating for data rate variations in a digital equalizer, comprising the steps of:

receiving an input signal from a transmission medium, wherein the input signal has a variable data rate;

providing an equalizer core that applies a transfer function to the equalizer input signal to compensate for losses incurred in the transmission medium; and

varying a bandwidth of the transfer function to compensate for variations in the variable data rate of the input signal.

36. The method of claim 35, comprising the further steps of:

providing a slicer that converts a core output signal from the equalizer core to a digital output signal having a fixed output swing that approximates a transmission swing of the input signal prior to transmission over the transmission medium; and

comparing the core output signal with the digital output signal to generate a bandwidth control signal, wherein the bandwidth of the transfer function is varied in proportion to the bandwidth control signal.

37. The method of claim 35, comprising the further step of:

varying a frequency dependant gain of the transfer function in proportion to the losses incurred in the transmission medium.

38. The method of claim 35, comprising the further steps of:

providing a slicer that converts a core output signal from the equalizer core to a digital output signal having a fixed output swing that approximates a transmission swing of the input signal prior to transmission over the transmission medium;

isolating a first frequency range in the core output signal to generate a first band-limited signal;

isolating a second frequency range in the digital output signal to generate a second band-limited signal; and

comparing the first band-limited signal with the second band-limited signal to generate a bandwidth control signal, wherein the bandwidth of the transfer function is varied in proportion to the bandwidth control signal.

39. The method of claim 38, comprising the further steps of:

comparing the first band-limited signal with the second band-limited signal to generate a band-pass control signal; and

varying the first and second frequency range in proportion to the band-pass control signal.

40. The method of claim 35, comprising the further steps of:

providing a slicer that converts a core output signal from the equalizer core to a digital output signal having a fixed output swing that approximates a transmission swing of the input signal prior to transmission over the transmission medium;

detecting a first energy-level in the core output signal;

detecting a second energy-level in the digital output signal; and

comparing the first energy-level with the second energy-level to generate a bandwidth control signal, wherein the bandwidth of the transfer function is varied in proportion to the bandwidth control signal.

41. A method of compensating for data rate variations in a digital equalizer, comprising the steps of:

receiving an input signal from a transmission medium, wherein the input signal has a variable data rate;

providing an equalizer core that applies a transfer function to the equalizer input signal to compensate for losses incurred in the transmission medium;

providing a slicer that converts a core output signal from the equalizer core to a digital output signal having a fixed output swing that approximates a transmission swing of the input signal prior to transmission over the transmission medium;

isolating a first frequency range in the core output signal to generate a first band-limited signal;

isolating a second frequency range in the digital output signal to generate a second band-limited signal;

detecting a first energy-level in the core output signal;

detecting a second energy-level in the digital output signal;

comparing the first energy-level with the second energy-level to generate a single-stage gain control signal;

varying a frequency dependant gain of the transfer function in proportion to the single-stage gain control signal;

varying a frequency dependant gain of the transfer function in proportion to the single-stage gain control signal; and

varying the first and second frequency range in proportion to the single-stage gain control signal.